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Notes on the genus *Ilyocryptus* Sars, 1862 (Cladocera: Anomopoda: Ilyocryptidae). 8. *Ilyocryptus isanensis* sp.n. from North-East Thailand

Заметки о роде *Ilyocryptus* Sars, 1862 (Cladocera: Anomopoda: Ilyocryptidae). 8. *Ilyocryptus isanensis* sp.n. из северо-восточного Таиланда

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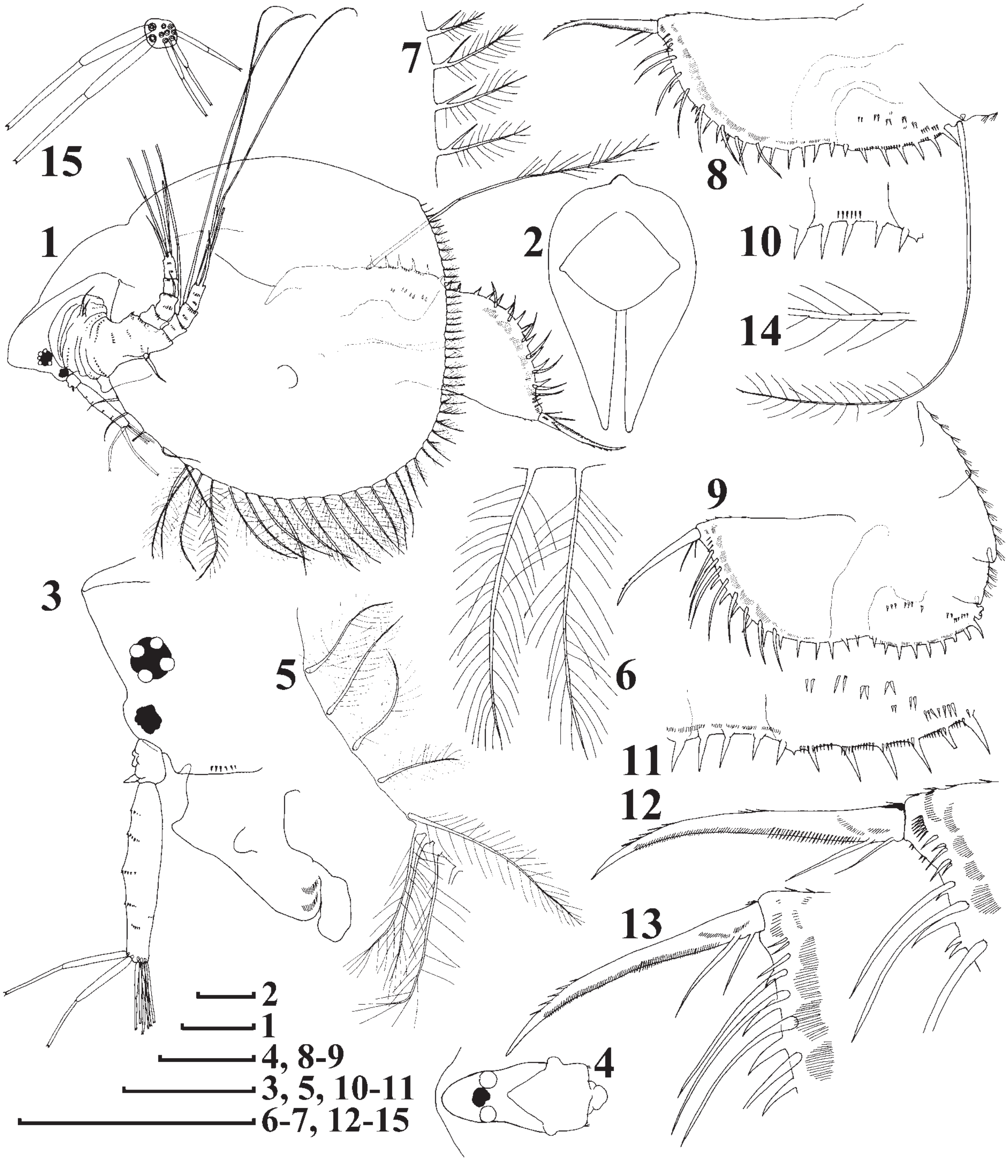
КЛЮЧЕВЫЕ СЛОВА: ветвистоусые ракообразные, Cladocera, Anomopoda, *Ilyocryptus*, морфология, систематика, Азия, Таиланд.

ABSTRACT. Historically, all populations of *Ilyocryptus* Sars, 1862 (Cladocera: Anomopoda: Ilyocryptidae) with complete moulting and the anus positioned medially on the postabdomen were assigned to *Ilyocryptus agilis* Kurz, 1878, a presumed cosmopolitan species. Recently, populations previously regarded as *I. agilis* from the Neotropics and tropical Africa were determined to be separate species. Likewise, we found that populations in NE Thailand represented a new species, *Ilyocryptus isanensis* sp.n. (Ilyocryptidae, Anomopoda, Cladocera). *I. isanensis* differs from Palearctic *I. agilis* in possessing: (1) a less compressed body with a low dorsal keel; (2) short setae at the posteroventral angle of valve; (3) numerous, fine additional spinules near the preanal teeth; (4) shorter preanal teeth; (5) armature of largest seta of outer distal lobe of limb I; (6) armature of four setae near inner-distal margin of limb IV; (7) fine setules on limb VI; (8) well-developed column-like projections on the ephippium; and (9) a thicker antenna I in males.

РЕЗЮМЕ. Традиционно, все популяции рода *Ilyocryptus* Sars, 1862 (Cladocera: Anomopoda: Ilyocryptidae) с неполной линькой и серединным положением анального отверстия на постабдомене относились к *Ilyocryptus agilis* Kurz, 1878, который рассматривался как вид с космополитическим распространением. Недавнее исследование популяций, ранее рассматриваемых как *I. agilis* из неотропической зоны и тропической Африки выявило, что это отдельные виды. Мы нашли, что популяции из северо-восточной части Королевства Таиланд принадлежат к новому виду, *Ilyocryptus isanensis* sp.n., сходному с палеарктическим *I. agilis*, но отличающимся от последнего по: (1) менее сжатому телу и более низкому спинному килю; (2) коротким щетинкам на задне-брюшной части створки; (3) многочисленным, тонким спинулам около преанальных зубцов; (4) более коротким пренанальным зубцам; (5) вооружению наибольшей щетинки внешней дистальной доли ноги I; (6) вооружению четырех щетинок на внутренне-дистальном крае ноги IV; (7) нежным щетинкам на ноге VI; (8) хорошо развитым колонновидным выростам на эфиппиуме; (9) более толстой антенной I у самца.

Introduction

For most of the 20th century ilyocryptid species with complete moulting and an anus positioned medially on the postabdomen were assigned to *Ilyocryptus agilis* Kurz, 1878, a presumed cosmopolitan species [Smirnov, 1976]. Similar forms, with lateral horns on the valves were found subsequently in the Palearctic and Neotropics [Mordukhai-Boltovskoi & Chirkova, 1972; Paggi, 1989]. Also, Smirnov [1976] "restored" the neglected *I. tuberculatus* Brehm, 1913. Then, *I. agilis* s. str. was redescribed by Kotov [1999], but its presence was confirmed only in the Palearctic. Paggi (1992) provided evidence that *I. agilis* was absent in the Neotropics [Paggi, 1992]. Kotov [2000] presented



Figs 1–15. *Ilyocryptus isanensis* sp.n., parthenogenetic females from the type locality, a temporary pond in Ban Non Muang subdistrict, near Khon Kaen University campus, Khon Kaen Province, NE Thailand: 1, 2 — holotype, lateral and anterior view; 3, 4 — head in lateral and ventral view; 5–7 — marginal setae in anterior, middle and posterior portions of valve; 8, 9 — postabdomen; 10, 11 — anus and preanal margin; 12, 13 — distal portion of postabdomen; 14 — postabdominal seta; 15 — antenna I in distal view. Scale 100 µm.

Рис. 1–15. *Ilyocryptus isanensis* sp.n., партеногенетическая самка из типового местообитания, безымянного временного пруда в районе Бан Нон Муанг, около кампуса Кхон Кэнского Университета, Провинция Кхон Кэн, северо-восточный Таиланд: 1, 2 — голотип, вид сбоку и спереди; 3, 4 — голова, вид сбоку и с брюшной стороны; 5–7 — щетинки на передней, средней и задней части створки; 8, 9 — постабдомен; 10, 11 — анальное отверстие и преанальный край; 12, 13 — дистальная часть постабдомена; 14 — постабдоминальная щетинка; 15 — Антенна I, вид с дистального конца. Масштаб 100 мкм.

evidence that *I. agilis* was absent from tropical Africa. In each case, *I. agilis* had been confused with superficially similar species. Other records of *I. agilis* from tropical localities should be treated as dubious following "Frey's [1982]" non-cosmopolitanism hypothesis for cladocean distributions.

We found that *agilis*-like populations from Thailand belong to a new species, which is described below. *Ilyocryptus isanensis* sp.n. is the second new species in the genus *Ilyocryptus*, described recently from Thailand (after *I. thailandensis* Kotov and Sanoamuang, 2004).

Methods

Sampling, operations with preserved specimens, preparation of line drawings and SEM technique are described in previous papers [Kotov et al., 2002; Kotov & Sanoamuang, 2004].

"Conventional" measurements were made (see scheme in Kotov et al., 2002), *viz*: body length (BL), height (BH) and width (BW); head length (HL) and width (HW); eye diameter (ED); valve length (VL); number of marginal elements (NE); number of setae in antero-ventral bunch (NB); number of setae with single basal spines (NS); maximal length of a seta on antero-ventral (AV) and postero-ventral valve portion (PV); postabdomen length (from base of claw to base of postabdominal setae) (PL) and height (PH); anus length (AN), length of preanal part of postabdomen (PR); number of preanal teeth (NT); number of large (NL), medium-sized (NM) lateral setae; postabdominal claw length (CL); length of more distal (DS) and more basal spine (BS) on base of claw; number of distal denticles on claw (DD); rudimentary additional denticles on middle part of claw (AD); length of postabdominal (natatorial) seta (SN); length of basal segment of postabdominal seta (BA), antenna I length (AL), maximal diameter (DA) and its proximal segment length (PS); length of second antenna (without apical setae) (SL); length of apical spines of exopod (AS) and endopod (AP), length of third exopod segment (TH) and of spine on its second segment (SE); maximal length of apical swimming seta (SW) of second antennae, length of distal (DI) and proximal (PX) lateral swimming seta on antennal exopod. Some relative parameters were calculated for each animal, similarly to previous publications [Kotov et al., 2002].

Results

Ilyocryptus isanensis **sp.n.**
Figs 1–70.

TYPE LOCALITY. An unnamed temporary pond (16°28'05"N, 102°49'04"E) in Ban Non Muang subdistrict, appr. 2 km from the north end of Khon Kaen University campus, Khon Kaen Province, NE Thailand. The type series was collected on 07.vi.1998 by L. Sanoamuang.

TYPE MATERIAL. Holotype: parthenogenetic ♀, 0.53 mm, tube NHM 2003.588., in the Natural History Museum, London, United Kingdom. Label of the holotype: "*Ilyocryptus isanensis* n.sp., 1 parth. ♀ from unnamed pond in Ban Non Muang subdistrict, Khon Kaen Province, NE Thailand, HOLOTYPE". Allotype: adult ♂, 0.41 mm, tube NHM 2003.589. Paratypes: 15 parthenogenetic and ephippial ♀♀, and 8 ♂♂, tube NHM 2003.590-612. in the Natural History Museum, London; 13 parthenogenetic and ephippial ♀♀, and 8 ♂♂, tube MGU Ml 27 in the Zoological Museum of Moscow State University, Moscow, Russia.

OTHER MATERIAL STUDIED. Many parthenogenetic and ephippial ♀♀, ephippia and ♂♂ from a flooded rice field near Pon Pang village, Kusuman district, Sakon Nakhon Province, NE Thailand, collected on 02.vii.1989 by G. Chapman.

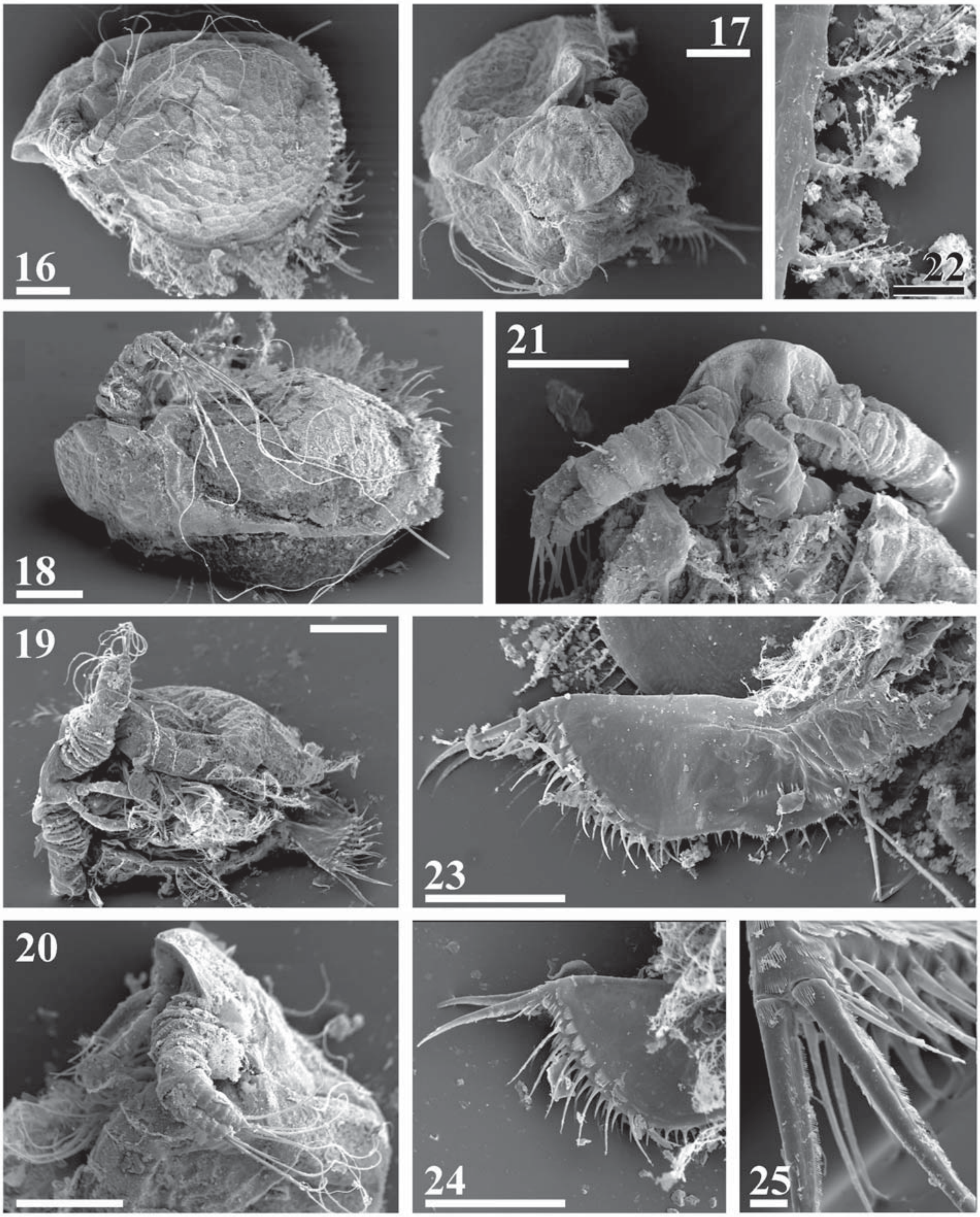
DIAGNOSIS. Parthenogenetic female body with distinct postero-dorsal angle, moderately thick, with low dorsal keel. Moulting complete. Ocellus diameter more than half of eye diameter. Each seta at posterior margin with a thick basal portion, armed with a single spine-like setule. Postabdomen with preanal margin short, slightly convex, with straight, non-duplicated teeth subequal in size, slanting to the margin. A series of small spinules laterally near each preanal tooth. An oblique row of denticles on lateral faces of postabdomen basally. Anus positioned medially on postabdomen, with fine spinules on internal wall near the opening. Paired spines of subequal length, lateral setae not reaching anus, significantly longer than the spines. Postabdominal claw with 4-6 denticles in distal portion along ventral side, setules on its base short. Distal spine on base of claw longer then basal one. Postabdominal seta shorter than body, with distal segment regularly feathered by relatively long hairs. Antenna I long, proximal segment with well-developed hillocks and finger-like projection, distal segment with incisions bearing transverse rows of denticles. Distal end of antenna I without hillocks, two of aesthetascs remarkably larger that the rest and located at a short distance from the rest, length of largest aesthetasc more than half the distal segment. Antenna II long, setae on its coxal part of different length. Distal sensory seta and distal burrowing spine subequal in size. Apical swimming setae with tips as hooks. Proximal lateral swimming seta shorter than distal one, both with setules longer and sparser than those on apical setae. Spine on basal segment of exopod longer than the second segment. Limb I with outer distal lobe bearing a large seta, setulated unilaterally in basal part, and bilaterally in distal part, and a second, short seta. Two ejector hooks of similar size, no other setae in their region. No remainder of gnathobase I on limb base. Limb VI with inner margin bearing six bunches of few, relatively fine setules.

Ephippial female with valves additionally chitinized and supplied with a distinct additional sculpture in dorsal and middle part, dorsal keel better developed than that in parthenogenetic female.

Adult male body with straight dorsal margin, more compressed laterally, with high dorsal keel. Antenna I thick and massive, its distal segment with only three transverse rows of denticles in basal half. Additional male seta long, located on ventral surface of distal segment in its middle. Three aesthetascs located near inner margin and markedly longer than the other aesthetascs.

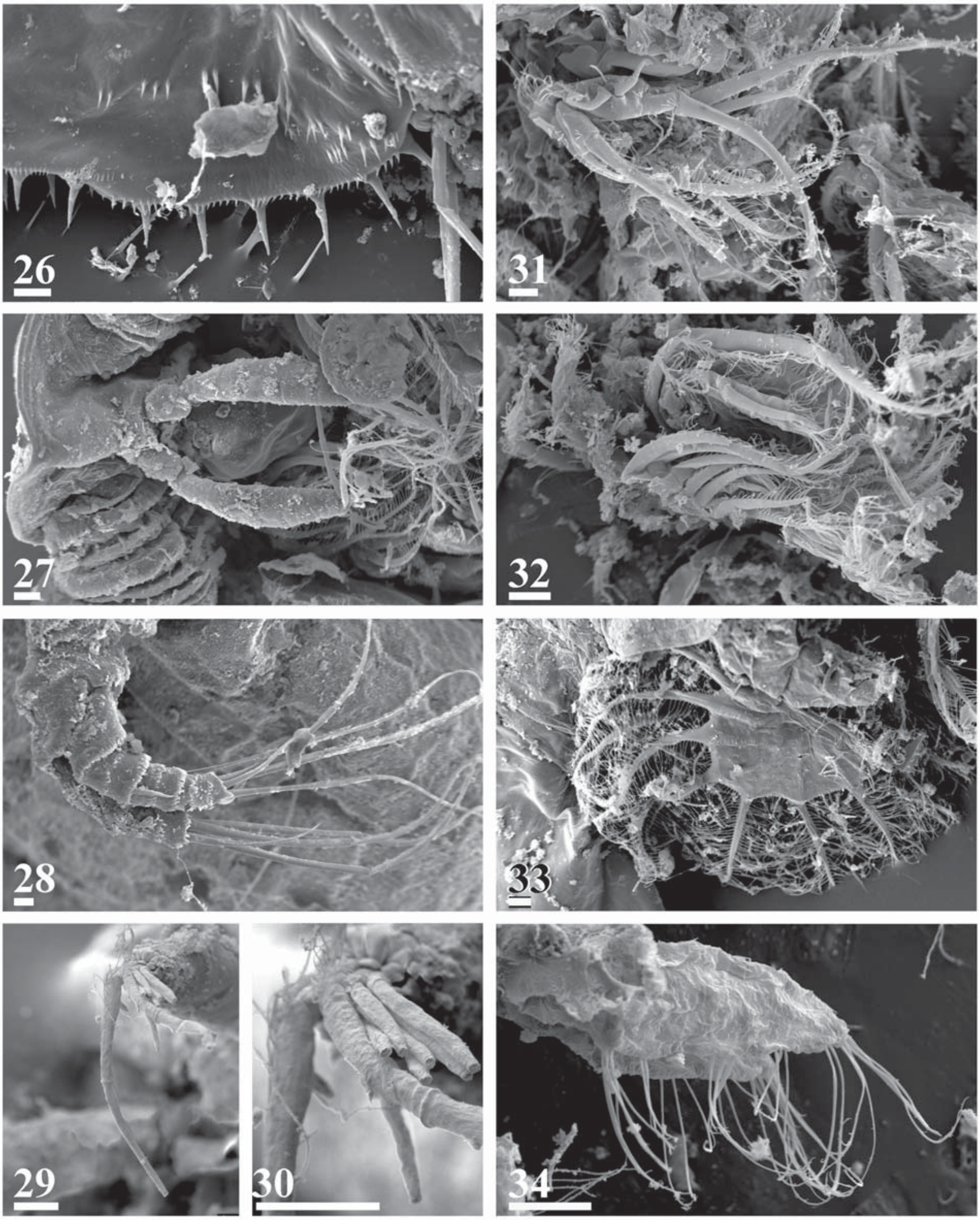
Size relatively small, up to 0.77 mm.

DESCRIPTION. Parthenogenetic female. Body widely-triangular-ovoid in lateral view (Figs 1, 16), not high for the genus (BH/BL = 0.67–0.75 in adults, 0.59–0.64 in juveniles). Dorsal margin with distinct cervical incision, dorsum of valves moderately and regularly arched, postero-dorsal



Figs 16–25. *Ilyocryptus isanensis* sp.n., parthenogenetic females from a temporary pond in Ban Non Muang subdistrict, NE Thailand: 16–19 — adult in lateral, anterior, dorsal and ventral view; 20, 21 — head in lateral and ventral view; 22 — setae at posterior margin of valve; 23, 24 — postabdomen and its distal portion in lateral view; 25 — postabdominal claws in venral view. Scales: 100 μm (16–21, 23, 24) and 10 μm (22, 25).

Рис. 16–25. *Ilyocryptus isanensis* sp.n., партеногенетическая самка из временного пруда в районе Бан Нон Муанг, северо-восточный Таиланд: 16–19 — взрослая самка, вид сбоку, спереди, со спинной и брюшной стороны; 20, 21 — голова, вид сбоку и спереди; 22 — щетинки на заднем крае створки; 23, 24 — постабдомен и его дистальная часть, вид сбоку; 25 — постабдоминальные коготки, вид с брюшной стороны. Масштаб: 100 мкм (16–21, 23, 24) и 10 мкм (22, 25).



Figs 26–34. *Ilyocryptus isanensis* sp.n., parthenogenetic females from a temporary pond in Ban Non Muang subdistrict, NE Thailand: 26 — preanal part of postabdomen; 27 — antennae I; 28 — antenna II, 29, 30 — aesthetascs on antenna I; 31 — limb I; 32 — limbs I–II; 33, 34 — limb IV and VI. Scale 10 μm.

Рис. 26–34. *Ilyocryptus isanensis* sp.n., партеногенетическая самка из временного пруда в районе Бан Нон Муанг, северо-восточный Таиланд: 26 — преанальная часть постабдомена; 27 — антенны I; 28 — антенна II, 29, 30 — эстетаски антенны I; 31 — нога I; 32 — ноги I–II; 33, 34 — ноги IV и VI. Масштаб 10 мкм.

angle distinct. In anterior view (Figs 2, 17), body moderately thick (BW/BL = 0.51–0.57) (in contrast with compressed body in *I. agilis*, see Kotov, 1999), cordate, maximum width of body in the dorsal portion of valves, with low medial dorsal keel. In ventral or dorsal view (Figs 18, 19) body subovoid, thick. No special structures were noted on head or valves. Valves with inflated polygonal reticulation (Figs 16–18), marginally visible with optical microscopy. Moulting complete.

Head large for the genus (HL/BL = 0.35–0.41), in lateral view with ventral margin generally straight, but with a slight prominence (basis for antennae I) in posterior head part (Figs 3, 20). Low fold surrounds base of labrum, with fine denticles on it (Fig. 3). Head shield subovoid in dorsal view, with prominent fornices (HW/BL = 0.38–0.42), dorsal head pore not found. Compound eye of size normal for the genus (ED = 25–29 μm); ocellus irregular in shape, with diameter more than half of eye diameter.

Labrum wide, spatulate in ventral view (Figs 4, 21), with lateral projections in its middle portion on each side; in posterior (distal) portion, two rows of setules on each side (Fig. 3). In lateral view, labrum robust, subrectangular; with a shallow projection in its basal portion. Distal labral plate large, boot-shaped.

Valves large, subovoid, with numerous marginal setae (VL/BL = 0.74–0.77, NE = 50–54). Four anteriormost setae short, relatively sparsely and finely setulated (Figs 1, 5), posterior to these setae, a bunch of closely set setae with length varying significantly among individuals (NB = 4–5, AV/BL= 0.19–0.25), each with slightly inflated base, the anteriormost seta with base located on external surface of valve with trunk directed toward the posteriorly and distally, crossing over the following setae. Next set of setae plumose, regularly distributed along ventral margin (Fig. 6), longest setae located in middle-posterior portion of ventral margin (length up to 0.23 of body length). Setae at postero-ventral region relatively short (PV/BL = 0.12–0.14), in contrast to *I. agilis*, which has well-developed postero-ventral bunch of setae. Each seta at posterior margin (Figs 7, 22) with a thick proximal portion, armed with a single spine-like setule, and slender distal portion armed with fine setules (NS = 23–27).

Abdomen long, with relatively short abdominal projection on the first segment (Figs 9, 23). Dorsal surface of all segments with several transverse rows of setules.

Postabdomen large (PL/BL = 0.51–0.54), not high for the genus (PH/PL = 0.41–0.45), with maximal height in basal region of postanal part (Figs 8, 9, 23), its dorsal margin with distinct anal depression. Preanal margin (Figs 11, 26) short (PR/PL = 0.35–0.39), slightly convex, with a small base of postabdominal setae posteriorly and a series of regularly located straight teeth (NT = 7–9), which are non-duplicated, subequal in size, not too large (in contrast to *I. agilis*), and slanting to the margin. The basalmost tooth located closely to base of postabdominal setae. A series of small spinules lies laterally near each preanal tooth, in contrast to *I. agilis*, with few robust teeth. An oblique row of denticles on lateral faces of postabdomen basally. Anus small (AN/PL=0.13–0.15), with fine spinules on internal wall near the opening (Fig. 10). On each side of distal (anal plus postanal) portion of postabdomen, a row of submarginal spines (so-called paired spines) of subequal length (NP = 12–14), and a row of large lateral setae (NL = 7–8), which are noticeably longer than the spines. There is a distinct gap between the basalmost seta and anus. Near claw base, 1–2 groups of medium-sized lateral setae (NM = 3–6), and series of rudimentary lateral setae (Figs 12, 13, 24). Row of fine setules at bases of large, middle-sized and rudimentary lateral setae.

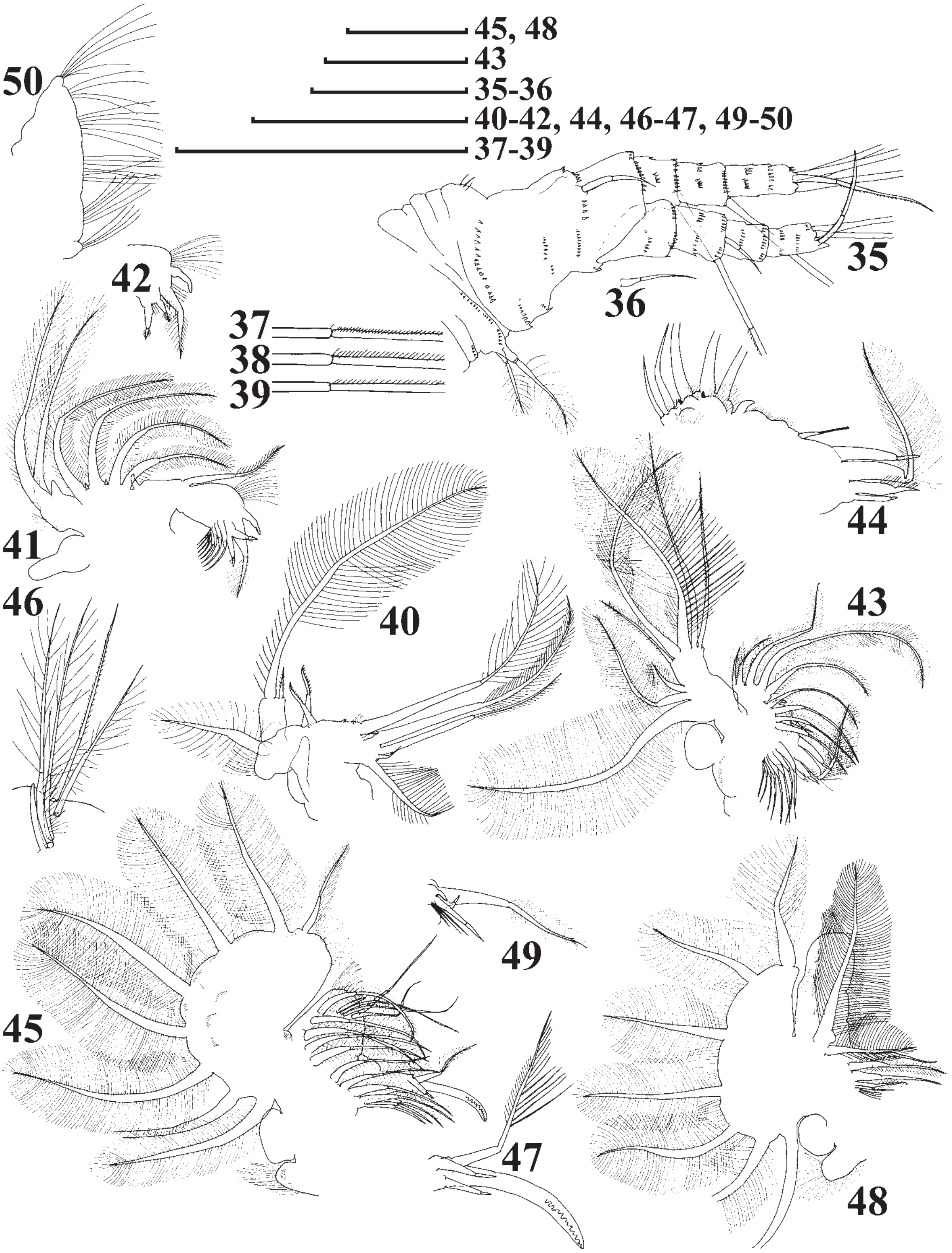
Postabdominal claw relatively short for the genus (CL/PL = 0.37–0.43), slightly bent in distal half. On outer side, two successive series of thin setules along the dorsal margin, and an oblique, short series at base of claw; additional denticles in distal and middle portion along ventral side (DD = 4–6, AD = 0–4). A group of short setules immediately on claw base ventrally (Fig. 25). Two relatively large spines (so-called basal spines) on base of each claw, distal one markedly longer than basal one (DS/BS = 1.22–1.45). Postabdominal seta markedly shorter than body, but longer than postabdomen (SN/PL = 1.37–1.48). Basal segment markedly shorter than distal one (BA/SN = 0.36–0.40), the latter regularly feathered by relatively long hairs (Fig. 14).

Antenna I two-segmented, long for *Ilyocryptus* (AL/BL= 0.20–0.22; DA/AL = 0.16–0.19), almost straight in dorsoventral plane (Fig. 3), but curved in transversal plane (Fig. 27). Bases of antennae I not compressed against each other. Proximal segment relatively short (PS/AL = 0.18–0.20), with well-developed hillocks and finger-like projection on anterior face. Distal segment elongated, somewhat extended in the middle part, with incisions bearing transverse rows of denticles. Distal end of antenna I truncated, without hillocks, bearing nine aesthetascs, two of them remarkably larger that the rest and located in inner part of distal surface of antenna I at a short distance from rest (Figs 15, 29, 30), length of largest aesthetasc more than half the distal segment. Tips of aesthetascs seem to be bifurcated under optical microscope (Fig. 15), but this is an illusion: in reality, there is a conical, chitinized depression on tip of each aesthetasc (Fig. 30), which looks like a bifurcation in lateral view.

Antenna II (Figs 16–21) long for the genus (SL/BL = 0.38–0.44), coxal part with two setulated sensory setae of different length (Fig. 35). Basal segment with distal sensory seta (Fig. 36) and distal burrowing spine subequal in size, the spine projected behind distal end of basal segment. Antennal branches elongated, on all segments, there are well-developed denticles around distal segment ends, and rows of similar denticles in middle part, exopod longer than endopod. Swimming setae 0-0-0-3/1-1-3, spines 0-1-0-1/0-0-1. Apical swimming setae remarkably long (SW/BL = 0.51–0.72), bisegmented, their distal segments unilaterally setulated with short setules (Fig. 37), tips of setae as hooks (Fig. 1). Proximal lateral swimming seta shorter than distal one (PX/BL = 0.34–0.39, DI/BL = 0.43–0.48), distal segments of both setae (Figs 38, 39) with setules longer and sparser than those on apical setae. Apical spines about twice longer than the apical segments (AS/AP = 0.77–0.92), spine on basal segment of exopod longer then the second segment (TH/SE=1.2–1.5).

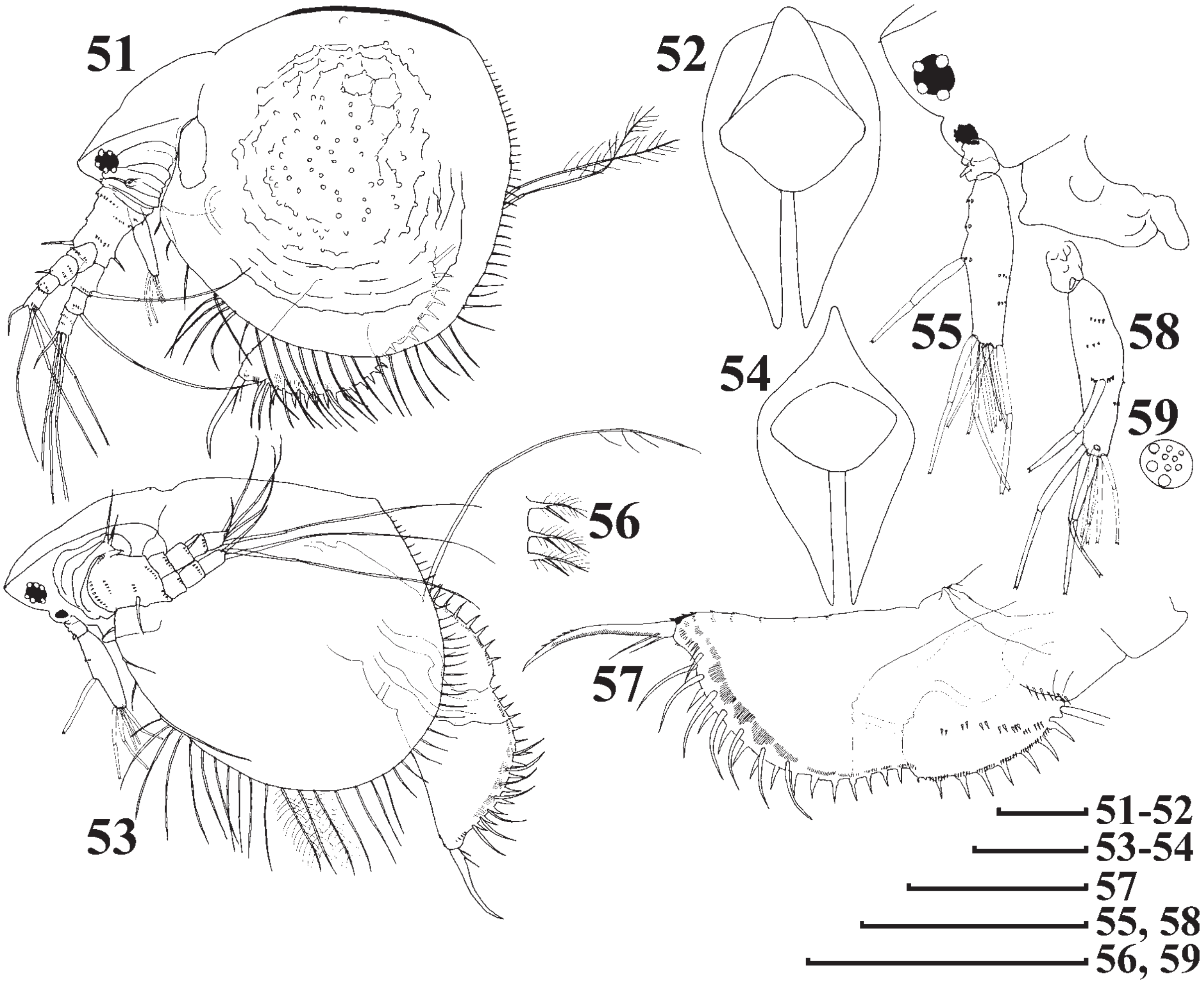
Limb I (Figs 31, 40). Cylindrical outer distal lobe bears a large seta, unilaterally setulated in basal portion, and bilaterally feathered in distal part (in contrast to *I. agilis*, see Kotov, 1999), and a second seta which is small (shorter than the lobe), finely setulated. A long, feathered seta near base of outer distal lobe. Two ejector hooks of similar size, no other setae in this region, as in some other species [Kotov et al., 2002]. On the inner margin of limb I, there are four long and differently armed setae, and a small rudimentary one. A relatively large receptor between bases of two ventralmost setae, a very small receptor midway between the ejector hooks and ventralmost large seta. No remainder of gnathobase I on limb base.

Limb II (Figs 32, 41). Sub-quadrangular distal lobe bears two long setae, bilaterally setulated from base to top, a small bud-like element, and two groups of setules on its outer surface. Along inner margin of limb, four bilaterally setulat-



Figs 35–50. *Ilyocryptus isanensis* sp.n., appendages of parthenogenetic females from a temporary pond in Ban Non Muang subdistrict, NE Thailand: 35, 36 — antenna II and its distal sensory seta; 37–39 — apical, distal and proximal lateral swimming setae; 40 — limb I; 41, 42 — limb II and distal armature of its gnatobase; 43, 44 — limb III and its inner portion; 45–47 — limb IV, its inner-distal corner and distal armature of gnathobase; 48, 49 — limb V and distal armature of its gnathobase; 50 — limb VI. Scale 100 μm.

Рис. 35–50. *Ilyocryptus isanensis* sp.n., головные и грудные придатки партеногенетической самки из временного пруда в районе Бан Нон Муанг, северо-восточный Таиланд: 35, 36 — антенна II и ее дистальная чувствительная щетинка; 37–39 — апикальная, дистальная и проксимальная латеральные плавательные щетинки; 40 — нога I; 41, 42 — нога II и дистальное вооружение ее гнатобазы; 43, 44 — нога III и ее внутренняя часть; 45–47 — нога IV, ее внутренне-дистальная часть и дистальное вооружение ее гнатобазы; 48, 49 — нога V и дистальное вооружение ее гнатобазы; 50 — нога VI. Масштаб 100 мкм.



Figs 51–59. *Ilyocryptus isanensis* sp.n. from a temporary pond in Ban Non Muang subdistrict, NE Thailand: 51, 52 — ephippial female in lateral and anterior view; 53, 54 — adult male in lateral and anterior view; 55–57 — its head, setae on posterior margin of valve and postabdomen; 58, 59 — antenna I in lateral and distal view. Scale 100 µm.

Рис. 51–59. *Ilyocryptus isanensis* sp.n. из временного пруда в районе Бан Нон Муанг, северо-восточный Таиланд: 51, 52 — эфиппиальная самка, вид сбоку и спереди; 53, 54 — взрослый самец, вид сбоку и спереди; 55–57 — его голова, щетинки на заднем краю створки и постабдомен; 58, 59 — антенна I, вид сбоку и с дистального конца. Масштаб 100 мкм.

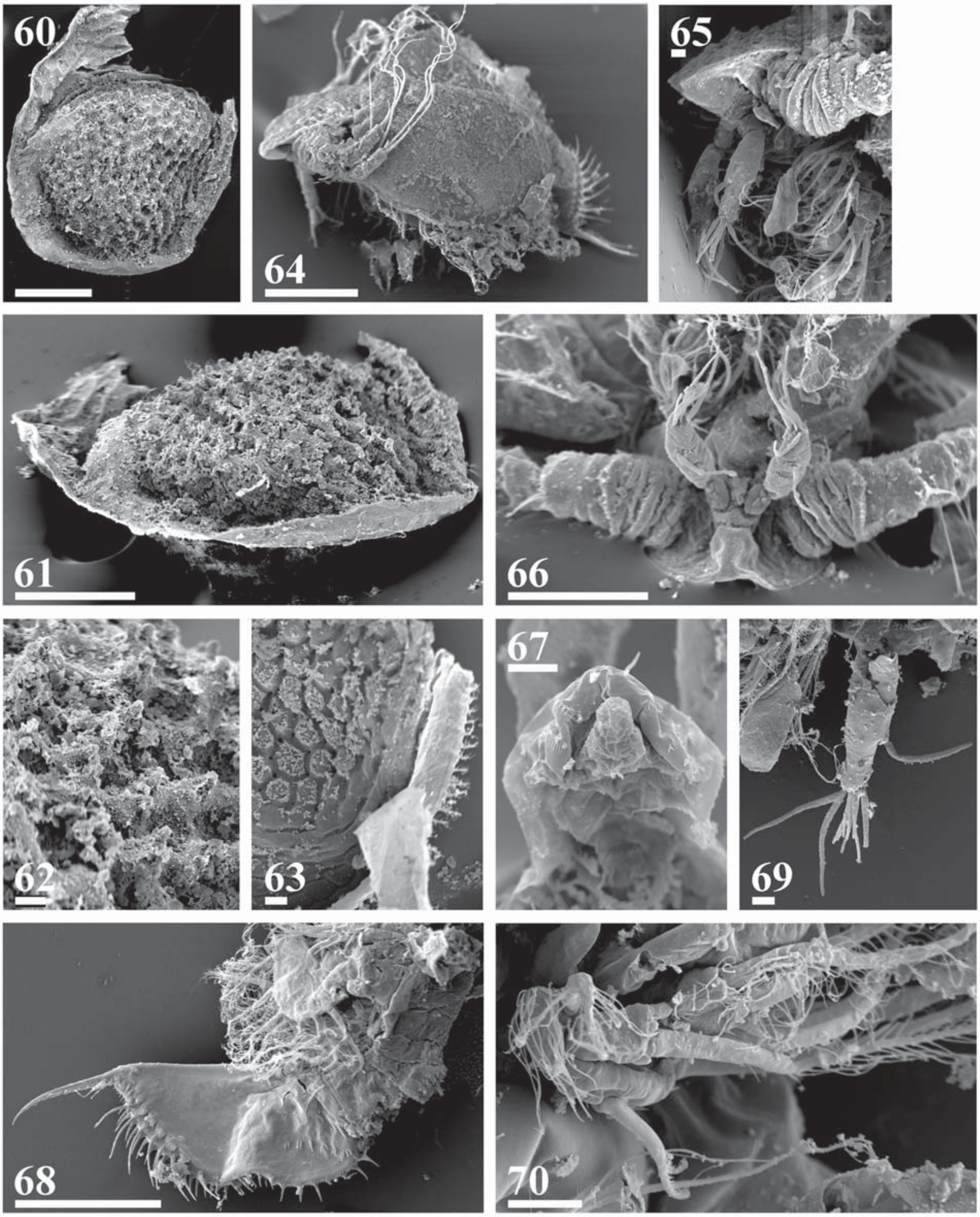
ed setae, with size somewhat decreasing toward the gnathobase, with small receptors near second and third setae of this row. Inner portion of limb strongly projected and somewhat inflated, a curved sensillum at the base of this projection. A single bisegmented beating seta armed with short, fine setules in distal part, near gnathobase. Distal armature of gnathobase with four closely located setae (Fig. 42), filter plate with eight short, bisegmented setae.

Limb III (Fig. 43). Exopodite with five terminal (armed by different manner), and three lateral setae. Distal endite (Fig. 44) with two relatively short feathered setae of different length distally, three large setae of different size, bilaterally setulated from base to top, and two small receptors. Basal endite anteriorly with a row of four soft setae (Fig. 43), more posteriorly with a curved sensillum near border with distal endite, and a single beating seta near gnathobase (Fig. 44), its boundary with gnathobase unclear. Four setae in the distal armature of gnathobase, filter plate with 8 setae.

Limb IV (Fig. 45). Large subovoid exopodite with 8 feathered setae (Fig. 33), the distalmost seta short and feathered with short setules. Inner-distal portion in the form of a flat lobe, near exopodite on its posterior face there are with five long setae, bilaterally feathered from base to top. Near inner margin, a group of four thin setae, differently armed (Fig. 46) (in contrast to *I. agilis* with uniform armature of these setae), a relatively short, slightly curved sensillum near base of basalmost member of this group. Distal armature of gnathobase with four elements (Fig. 47), filter plate with 8 setae, no distinct border between filter plate and row of setae of inner limb face.

Limb V (Fig. 48). Large subovoid exopodite armed with seven large setae. Inner-distal portion of limb V as a flat lobe, but this lobe markedly larger than that in limb IV. Two setulated setae on the posterior face of limb. No distinct border between basal endite and gnathobase. Distal armature of gnathobase with 4 elements (Fig. 49), filter plate with 4 setae and group of setules.

Limb VI (Figs 34, 50). Small plate with inner margin bearing six bunches of few, relatively fine setules (in contrast to *I. agilis*, with robust setules), 4–6 setules in each bunch.



Figs 60–70. *Ilyocryptus isanensis* sp.n. from a temporary pond in Ban Non Muang subdistrict, NE Thailand: 60, 61 — ephippium in lateral and dorsal view; 62, 63 — sculpture on its external and inner surface; 64–66 — adult male and its head in lateral and antero-ventral view; 67 — labrum in posterior view; 68 — postabdomen; 69, 70 — antenna I and limb I. Scale: 100 μm (60, 61, 64, 66, 68) and 10 μm (62, 63, 65, 67, 69, 70).

Рис. 60–70. *Ilyocryptus isanensis* sp.n. из временного пруда в районе Бан Нон Муанг, северо-восточный Таиланд: 60, 61 — эфиппиум, вид сбоку и со спинной стороны; 62, 63 — скульптура на его внешней и внутренней стенках; 64–66 — взрослый самец и его голова сбоку и с передне-брюшной стороны; 67 — лабрум, вид сзади; 68 — постабдомен; 69, 70 — антенна I и нога I. Масштаб: 100 мкм (60, 61, 64, 66, 68) и 10 мкм (62, 63, 65, 67, 69, 70).

Table 1. Characters of parthenogenetic females of four closely related species. Information on three latter species was excluded from Kotov [1999, 2000] and Kotov & Williams [2000].
Таблица 1. Признаки партеногенетических самок четырех близкородственных видов. Информация по трем последним из: Kotov [1999, 2000] и Kotov & Williams [2000].

Character	*I. isanensis* sp.n.	*I. tuberculatus*	*I. agilis*	*I. spinifer*-group
Moulting incomplete	-	-	-	+
BH/BL	0.67-0.75	0.78-0.85	0.67-0.75	0.72-0.83
BW/BL	0.51-0.57	0.62-0.67	0.40-0.44	less than 0.5
Brood pouch strongly inflated	-	+	-	-
Postero-dorsal angle distinct	+	-	+	+
Dorsal keel high	-	-	+	+
Reticulation on valves clear	+	-	+	+
HL/BL	0.35-0.41	0.27-0.32	0.22-0.28	0.30-0.46
Setae in postero-ventral bunch long	-	-	+	+
Distal burrowing spine on AII long	+	-	+	+
Length of apical swimming setae markedly different	-	+	-	-
SE/TH	1.20-1.50	0.63-0.74	more than 1	0.65-1.08
Tips of lateral swimming setae as hooks	+	-	+	+
Denticles laterally to first pecten of setules of postabdominal claws	-	+	-	-
Distal portion of long setae on distal lobe of limb I with long setules	+	+	-	+
Sensillum on limb II bent	+	-	+	+
Length and armature of four thin distal setae on limb 4 different	+	+	-	-

Ephippial female. Ephippial female is generally similar to parthenogenetic female in lateral view, only valves are modified (Fig. 51). Body height as in female (BH/BL = 0.68–0.72), incision between head and valves deep, dorsal margin of valves convex more slightly than that in parthenogenetic female. Dorsal and middle parts of valves additionally chitinized and supplied with a distinct additional sculpture: polygonal reticulation of this zone with angles of polygons prominent above surface of shell and bearing well-developed, high column-like tubercles (Figs 60–62), in contrast to I. agilis, with small columns. Dorsal keel low, thick, but better developed than that in parthenogenetic female (Fig. 52); the wall of valves in posterior part of dorsal margin thickened (Fig. 61). Anterior and ventral valve portion, and region of posterior edge not modified in comparison with parthenogenetic female, no demarcation line between ephippium and rest of valve. On inner wall of the ephippium, there is also a special sculpture (Fig. 63).

Adult male. Body less high as compared with female (BH/BL = 0.64–0.69), with straight dorsal margin due to absence of brood pouch (Figs 53, 64), postero-dorsal angle more distinct. In anterior view, body more compressed laterally, with high dorsal keel (Fig. 54). Head (Figs 55, 65, 66) larger than that in female, dorsal head pore well-seen, compound eye and ocellus large, labrum as in female (Fig. 67). Valve setae as in female (Fig. 56). Abdomen with rudimentary abdominal projection, gonopores open on ventral face of abdomen at postabdomen base. Postabdomen, postabdominal claws (Figs 57, 68) as in female. Postabdominal setae long, length equal with general body length. Antenna I (Figs 58, 65, 66, 69) with relative length as in female, but more thick and massive (AL/BL= 0.21–0.24; DA/AL = 0.23–0.25), in contrast to male of *I. agilis* which possesses a thin, agile antenna I (Kotov, 1999). Its distal segment slightly inflated in the middle, with only three transverse rows of denticles in basal half. Additional male seta long, located on ventral surface of distal segment in its middle. Aesthetascs of unequal length, three of them located near inner margin (Fig. 59) and markedly longer than the rest (approximately as long as male seta). Limb I (Fig. 70) as in female, without a copulatory hook.

SIZE. Holotype 0.53 mm, parthenogenetic females 0.32–0.77 mm (n = 20), ephippial females 0.49–0.54 mm (n = 5), ephippia 0.43–0.48 µm (n = 3); males 0.34–0.41 µm (n = 10) (no guarantee that only adult males were measured).

ETYMOLOGY. The species name refers to the region from which the species was first recognised, Isan, the traditional name of NE Thailand.

DISTRIBUTION. *I. isanensis* sp.n. is known only from two localities in NE Thailand. Here this species is markedly

less common than *I. spinifer* Herrick, 1882 and *I.* cf. *raridentatus* Smirnov, 1989.

DIFFERENTIAL DIAGNOSIS. Among ilyocryptids, this species is most similar to the Palearctic *I. agilis*, but differs from the latter in: (1) less compressed body with low dorsal keel; (2) short setae at postero-ventral angle of valve; (3) numerous and fine additional spinules near preanal teeth; (4) shorter preanal teeth; (5) armature of largest seta of outer distal lobe of limb I; (6) armature of four setae near inner-distal margin of limb IV; (7) fine setules on limb VI; (8) well-developed column-like projections on the ephippium; (9) thicker antenna I in male in the former (see explanations in the description).

Discussion

Recently, Kotov & Elías-Gutiérrez [2002] suggested that incomplete moulting appeared and disappeared several times in the evolution of the genus. Consistent with this non-monophyly of moulting hypothesis, *I. agilis s. str.* with complete moulting, is the closest relative of the *I. spinifer*-group, with incomplete moulting [Kotov & Dumont, 2000; Kotov & Elías-Gutiérrez, 2002; Kotov & Štifter, 2004]. *Ilyocryptus tuberculatus* Brehm, 1913 and *I. isanensis* sp.n. are apparently basal to the *agilis-spinifer* clade as evidenced by a set of plesiomorphic traits: (1) less compressed body with smaller dorsal keel; and (2) less developed spine-like setule on base of each posterior seta. Species differences are listed in Table 1.

This communication is the next step in the revision of *agilis*-like species, previously reported from all continents [Smirnov, 1976]. Several authors described *I. agilis* from Asia [Chiang Sieh-chin & Du Nan-shan, 1979; Chen Shou-zhong, 1993], but these descriptions were not detailed enough to conclude what species the author had described. The Asian fauna of the ilyocryptids requires further investigations.

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